36/7 February 1971

U.S. Department of Agriculture
Soil Conservation Service

SOIL conservation

XUM

SOIL
conservation

February 1971, Vol. 36, No. 7

The shape of things

An important part of soil and water conservation work involves reshaping bits of the earth's surface to control the flow of water.

Without the earthmoving industry —the manufacturers and distributors of equipment and the contractors who use it—modern conservation would be impossible.

Without the expertise of engineers and conservationists who help design both equipment and earthen structures, and plan where to use them, our efforts would be misdirected and ineffective.

Examples of conservation earthmoving in this issue show something of the ingenuity being used and the variety of problems being met.

Professionals and contractors pitched in together to install on-the-job sediment controls during construction of a highway interchange near Pittsburgh (p. 147).

In Utah and Wisconsin (pp. 156, 157), engineers met the challenges of problem sites in building dams to control floods and store water for beneficial uses.

Irrigation farmers in the Rio Grande Valley (p. 149) shape the entire surface of fields to gain positive control of irrigation water.

These examples are matched by countless others across the country as this important work goes forward.

COVER: Earth dam being built under Great Plains Conservation Program, Chase County, Nebr., will protect a feed yard, county road, and bridge from flooding.

147 Highway builders keep sediment on site
By John Robb

149 Irrigators shape their land for water control
By Billy Jack Garner

151 Where to build? New Orleans gets the answers

153 Putting conservation on golf course

154 Grass solves threat to Navy testing
By John Smithhisler

155 Prevention can prevent wind damage
By Deane Meredith

156 Methods solve construction problems
By Joseph H. Hanson and Scott B. Passey

157 Slurry trench stops water

159 Shining river
By Donald B. vonWolffradt

160 Conservation in action
Floods stopped, Kansas; no-wash crossings, Texas; growing facts, Wyoming; seeding rights-of-way, Missouri; conservation farm, Virginia

162 Erosion control along highways
By J. Guy Moorefield

163 Meetings

164 Review
World plan for agricultural development

166 Recon

167 From the Administrator
A big job being done, and to do

168 Streambank victory

Prepared in the Division of Information, Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. 20250

CLIFFORD M. HARDIN, Secretary of Agriculture
KENNETH E. GRANT, Administrator, Soil Conservation Service
BEN O. OSBORN, Editor
GEORGIE A. KELLER, Production Editor

SOIL CONSERVATION is the official magazine of the Soil Conservation Service, published monthly by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. Use of funds for printing this publication approved by the Director of the Bureau of the Budget July 17, 1968.
Reprint permission: Contents of this magazine may be reprinted without special permission. Credit is not required but is appreciated. Photos available on request.
Commercial names: Mention of commercial enterprises or brand names does not constitute endorsement or imply preference by the Department of Agriculture.
Subscription: $2.00 per year, $2.50 foreign. Single copy 25 cents. Discount of 25 percent on orders of 100 or more sent to same address. Order direct from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Mud and more mud . . .

Highway builders keep sediment on site during construction

By John Robb
Assistant state conservation engineer, SCS, Harrisburg, Pa.

Stemming the flow of mud from a major highway construction site during the bad weather of a mid-Appalachian winter is a problem to make engineers, contractors, and conservationists wonder if there aren't easier ways to make a living.

But when the people concerned with a project join their efforts in a common purpose they can greatly reduce erosion and sediment even as work progresses under the most difficult circumstances.

They did it on the 70-acre Campbells Run highway interchange near Pittsburgh, Pa. If it could be done there, it can be done elsewhere.

The project plan called for moving 6 million cubic yards of earth. Work started in the fall of 1969. When bad weather slowed construction, it was obvious that it did not slow erosion. Flood-control structures downstream and the growing public concern for the environment made it imperative that sedimentation be held to a minimum.

A meeting was arranged between the contractor, Glasgow Inc., of Glenside, Pa.; the resident engineer of the Pennsylvania Department of Highways, Jim Donovan; a representative of the Pennsylvania Department of Forests and Waters, Vernon T. Houghton, Jr.; and other concerned agencies, including the Soil Conservation Service. Together, they worked out methods of reducing erosion while work proceeded as well as while work was stopped by bad weather.

The deep, narrow valley of Camp-

Contractor, engineers, and conservation officials gave sediment control top priority in Campbells Run interchange.

XUM

Trees cleared from site helped check runoff.

bells Run makes installing of sediment-control measures unusually difficult. There is no room for conventional debris basins on the main stream, and the side tributaries are too steep for their use there. Since it was winter, seeding of temporary vegetation was impractical.

A series of horizontal benches and diversions, which would double for haul roads, were installed. They were laid out in broken patterns so no direct runoff would enter Campbells Run. The runoff water from the site was passed through a series of desilting basins.

An abandoned bridge near the lower end of the construction area was used to anchor a dumped-rock dam to trap and hold sediment. The basin will be cleaned when storage capacity is filled.

Burning of timber is not permitted in the Pittsburgh airshed area. To dispose of trees cleared from the site without causing air pollution, the contractor used the trunks to construct barriers upstream from the rock dam, thereby slowing the flow of runoff.

The limbs and brush were used to make additional barriers, which proved effective in removing sediment from the runoff of small storms.

Diversions which protect slopes from erosion also protect work areas where culverts are being formed and poured. They are relocated as necessary as the work progresses. Damage to control measures by unusually heavy storms is promptly repaired.

Campbells Run demonstrates that pollution and sedimentation can be controlled during construction even under difficult conditions. ♦

Soil and water conservation is big business

In numbers of machines, equipment hours, operator time, supplies, and quantities of earth moved, the magnitude of soil and water conservation action challenges the imagination.

Machines in any one year move 1 billion cubic yards of earth in installing the wide range of conservation practices required. This includes 258 million cubic yards for earth dams, 212 million for grassed waterways and channels, 82 million for terracing, and 352 million for land grading, leveling, and smoothing.

Other practices in conservation require additional amounts.

What does it take to move this mountain of earth each year? A survey completed in 1968 showed that conservation contractors, individual landowners and operators, and soil conservation districts own 457,000 pieces of equipment used primarily to install and maintain conservation work.

About 143,000 pieces of equipment are of the heavy construction type: Bulldozers, track-type tractors, heavy wheel-type tractor draglines, backhoes, motor graders, and tiling machines.

Remaining categories include carryalls, special plows, terracing machines, tree planters, special drills, and landplanes.

Into the conservation effort each year go 425,000 cubic yards of concrete, 3.9 million feet of corrugated metal pipe, 15 million feet of concrete pipe, 19 million feet of pipe of steel and other materials, 11 million feet of small-diameter water pipe, 12 million feet of tile, and 14 million feet of aluminum sprinkler pipe.

Getting vegetation on 4.3 million acres of pasture, critical erosion areas, and rangeland requires the spending of $111 million for seed, fertilizer, and lime.

For the protection and proper mangement of range, landowners install 14,000 miles of fence.—R. C. BARNES, *Engineering Division, SCS Washington, D.C.* ♦

Irrigators shape their land for water control

By Billy Jack Garner
Area engineer, SCS, Harlingen, Tex.

Around Harlingen in the Lower Rio Grande Valley of Texas, landowners shape their land for irrigation for several quite logical reasons.

Mostly, it is for the better control of water.

This means lower cost of labor for irrigating. It also means holding losses of water to a minimum.

Leveling of fields makes possible the even distribution of irrigation water and rainfall, resulting in uniform crop growth.

Land leveling on a large scale began in the Rio Grande Valley about 1950. In the 20 years since, nearly half of the Harlingen area's 780,000 acres of irrigated land has been graded to meet today's standards. The earth moved would build a dam 50 feet high and 100 miles long.

Most land-leveling jobs in the area require moving about 400 cubic yards of earth for each acre. Rougher land may raise this figure to 1,000 or even 1,500 cubic yards to the acre in some instances.

The average land-leveling job costs $75 an acre. Heavier jobs cost $150 or more an acre. The investment, most landowners say, is recovered in 3 years.

The most commonly used equipment for land leveling in the Lower Rio Grande Valley is a large farm tractor with two 4- or 6-cubic-yard carryall scrapers pulled in tandem.

At all points in the field, the land surface is graded within 0.1 foot or less of the planned elevation. The final work is done by floats or landplanes 45 to 80 feet long. These assure a smooth surface by filling in

Uneven fields (left) result in ineffective water use, land damage, and poor crops. Properly leveled (above), the furrows spread the water uniformly.

After the scraper, a landplane eliminates minor irregularities in the surface.

or cutting off minor irregularities left by the scrapers.

If deep cuts are necessary, they are made to a few inches below the planned elevation, and the areas are backfilled with topsoil. This eliminates or shortens the time required to bring such an area up to normal crop production. No other special soil treatment ordinarily is necessary.

Land leveling must be designed in accordance with variations in soils, the crops to be grown, the water supply, and the method of irrigation in each case. As in other parts of the United States, standards for land leveling in the Lower Rio Grande Valley are set forth in the local Soil Conservation Service Irrigation Guide. The guide is based on proved irrigation principles and knowledge of the special conditions of the local area.

Much of the land leveling in the Lower Rio Grande Valley is for the level irrigation method, which requires a surface that is essentially level with a very slight grade to facilitate water spreading and removal. For the graded border or graded furrow method, the land has somewhat more slope on which water is applied under a different principle of irrigation.

No matter how good a land-leveling job may be, shaping the land in itself will not accomplish the full benefits of a conservation-irrigation system. The real payoff comes from good water management that applies the correct amount of water at the right time and the right place—i.e., in the root zone—and with uniform distribution over the field.

Irrigators in the Harlingen area have found that land leveling, plus good water management, has paid big dividends in conservation of irrigation water, retention of needed rainfall, lower costs, and more uniform and better crops. ♦

XUM

Where to build? New Orleans gets the answers

New Orleans is a city hemmed in by water, marshes, and the Mississippi River.

The land is boggy, below sea level, and good building sites are at a premium.

"Where are we going to put all the people in the next 20 years?" the planners ask.

The city, with its suburbs, has well over a million residents now. Like most such centers, it is growing rapidly. Another million residents are expected in the next two decades.

The fact is New Orleans has run out of land for its needed development—almost. There is an abundance of land, however, for other uses.

A soil survey recently completed by the Soil Conservation Service, with the city paying half the cost, holds some of the answers needed by the puzzled New Orleans officials.

The Regional Planning Commission for Jefferson, Orleans, and St. Bernard parishes arranged with SCS for the survey and asked Mike Aulick, a planner with the commission, to head the project. The SCS, cooperating with the Crescent Soil and Water Conservation District, entered into an agreement with the commission for the special survey.

The commission selected 50,000 acres expected to bear the principal burden of development in the next 20 years.

The findings in the survey were not surprising. The soil scientists found the answer to why many homes and streets cracked, and why lawns sank away from the foundations. Organic soils occupy much of the area surveyed. They are different from mineral soil which is made up of sand, silt, and clay. Organic soil (peat and muck) is mostly grass that has partly rotted. When organic soil is drained, the surface subsides and oxygen gets to

No rustic decoration, the boards at right, but a needed addition after the driveway sank below the carport. A 3-year-old levee (left) built of Kenner muck was ruined by shrinkage of the organic material.

SCS Soil Scientist B. Spicer (above) tells a reporter and planning commission member about limitations of the organic soil beneath marsh grasses.

the old grass, which begins to decompose rapidly.

Some organic soils are 10 feet or more thick. They will subside several feet the first year after drainage and about an inch a year thereafter, depending on the level of the water table.

Aulick said the survey information will help planners make recommendations for general land uses. For example, it will show which land should be used for residential, commercial, light and heavy industrial purposes, where parks and playgrounds should be, and how sewage and drainage can best be done.

New Orleans is one of the first major metropolitan areas to program soil facts into computers to aid in making land use decisions. Soil properties including texture, wetness, and thickness of organic layers, along with other resource data such as population densities, will be programed.

"This way we can rapidly determine the areas best suited to each urban land use and avoid costly mistakes," Aulick explained. The soil survey also will help evaluate the soil problems and costs when it is necessary to modify the soil, remove it, or design special foundations or structures to overcome soil problems that cannot be removed or corrected.

The Planning Commission will make the survey available to the public as well as use the information in its own programs. SCS will continue to give technical help in choosing land uses and designing conservation treatments based on soils and other information.

Almost everybody agrees that most of the soils around New Orleans are not the best for building. But, as Aulick points out, "They are what we have to work with and I think the soil survey will help us put the land to its best use."

—DAYTON MATTHEWS AND S. A. THIBODEAUX, *soil scientist and district conservationist, SCS, New Orleans, La.* ♦

Job well done—a swimming area

Calvin Leftwich's accident led to the construction of a swimming area on his North Dakota farm. It would require swimming to restore the damaged nerve muscles in his leg.

With the help of the Soil Conservation Service through the Towner County Soil Conservation District, a small dam was built and the excavation area in the pool made deep enough to maintain fish in this northern community where ice often freezes to a depth of 3 feet or more.

But very little snow fell during the winter and expected runoff from the watershed was almost nil. Leftwich decided to pump water from a larger coulee just below the dam to provide water for boating and swimming.

His family handplanted some 50 individual trees to give shade and beauty to a selected picnic area. The picnic area and dam were grassed with native sod to provide quick erosion cover to these areas.

The Agricultural Stabilization and Conservation Service cost-shared the dam and pool development and windbreaks to surround the pool area. The Bureau of Sport Fisheries and Wildlife furnished bass and bluegill to stock the pond.

Leftwich has not said how much swimming he has done in his new swimming area, but he and his family have a beautiful recreation area only ¼ mile from their farmstead that provides fun for all—swimming, fishing, boating, and picnicking, a quiet place to rest and enjoy the beauty of nature; and a job well done—FRANK A. HOBBS, *district conservationist, SCS, Cando, N. Dak.* ♦

Putting conservation on golf course is par for district

When the Norwood Hills Country Club in St. Louis, Mo., set out to install an irrigation system —with improvement of greens a special objective—the path to tee-off led straight to the office of the St. Louis Soil and Water Conservation Distict.

The outcome was the customary agreement between landowner and district board. The difference was in the setting, one in an urban area with recreation the prevailing land use.

The Norwood Hills Club agreed to install all works of improvement as listed in its conservation plan, with the Soil Conservation Service giving technical assistance.

Available water would not be enough to keep the course in top condition. It was evident that a reservoir would be needed. SCS conservationists selected the site for the impoundment. Soil, geological, and topographic investigations showed the site feasible. SCS engineers designed the dam.

Fill material came from a nearby small watershed, which resulted in another smaller lake.

In time the system was in operation, with water going to points in the 300-acre layout through 13 miles of pipe. Two pumps deliver 1,300 gallons a minute when operating.

Water comes on by program, with time clocks set to start the system and to shut it off at the proper time.

The first summer Norwood Hills used 55 million gallons of water for irrigation. Thirty million gallons of it came from the County Water Company for $8,000. The rest came from the club's own supply. The lakes cost $25,000. The club figured the water from the lakes was worth $5,000, indicating that the lakes would return their cost in 5 years.

The cost of the entire irrigation project came to a quarter of a million dollars, with the delivery system representing the biggest part.

The club placed one of the tees on the earthfill dam and planted ornamental shrubs around the lake borders. Ducks made themselves at home on the water. And members often observed how much beauty had been added to the course.

The supervisors of the St. Louis District look upon the achievement at Norwood Hills as a logical—although a slight departure from the normal—service. In other words, in the district's business, applying conservation to a golf links is about par for the course.—MELVIN M. THOMPSON, *area conservationist, SCS, Fulton, Mo., and N. Howard Funk, district conservationist, Kirkwood, Mo.* ♦

This reservoir, developed as part of a conservation plan, is a pleasing scene to golfers on the Norwood Hills course in St. Louis. Its waters help to keep the greens in top condition.

XUM

Grass solves threat to Navy testing

By John Smithhisler
District conservationist, SCS,
Lihue, Kauai, Hawaii

Red dust carried by the winds sweeping across Makaha Ridge on Kauai, Hawaii, had been long accepted as a circumstance to be endured.

When the U.S. Navy put a test site there, the dust became a problem to be solved. It was a threat to delicate testing instruments.

Navy and maintenance company officers turned to the West Kauai Soil and Water Conservation District for advice. Soil Conservation Service specialists assigned to the district, after reviewing soil survey interpretations for the area, decided the practical solution would be to seed grass.

Lack of water and constant winds required careful plant selection. Navy conservationists and SCS plant materials specialists agreed that the grasses most likely to succeed were bermudagrass and buffelgrass. Buffelgrass seed for trial plantings was furnished by the SCS Plant Materials Center on Maui.

Low soil fertility, lack of moisture, and traffic from work crews hampered early grass growth. Each of these factors had to be overcome before grass cover could become established.

An arrangement on the use of water allocated to the site helped in providing some water for irrigation. The application of water together with fertilizer has been most important in seeing the project through some extremely rough periods, SCS conservationists said.

The irrigated bermudagrass lawn presents a real contrast with barren conditions of the past, say workers at the site. They expect the buffelgrass to cover the outlying areas.

Another conservation problem at the installation also was solved with selected plant materials. Hazardous gully erosion along the road was eliminated by filling washed-out areas with soil and planting grass as a protective cover. Kikuyugrass was planted in the high-rainfall, high-elevation portion of the steep, winding road. The middle portion of the road was planted to pangolagrass and the dry, lower elevation section of the road was planted to bermudagrass. ♦

Perched on a 2,000-foot cliff at ocean's edge, the tracking station's sensitive equipment was subject to high winds and swirling dust. Below, District Conservationist John Smithhisler checks growth of giant bermudagrass that now holds the soil.

An "ounce of prevention" can prevent wind damage

By Deane Meredith
District conservationist, SCS, Bay City, Mich.

The year 1965 was one of considerable loss for ill-prepared producers of sugar beets in some areas of Michigan.

Some 8,000 acres of sugar beets were literally blown out by wind.

It was the year, too, when a growing number of Michigan farmers began work on measures to protect land and crop from a repetition of the loss.

Conditions are ripe for a repeat performance in the beet-growing areas of the state. Fields are larger. Bigger equipment makes it possible to have more land ready to blow at a time. About 2,000 acres in Bay County are tiled for drainage each year. And more farmers are growing crops such as beets and beans which return less protective residue to the soil than grain or hay.

In setting out to prevent a recurrence of the 1965 setback, the beet grower usually inventories his land, identifying those areas with a tendency to blow. Next, the farmer plans for protection as a part of a crop rotation, not something to be done if time permits.

Wind-erosion control is accomplished by (1) providing a protective condition on the surface of the soil or (2) reducing the wind velocity to a nonerodible rate.

One practice which will do the job and provide more permanence than annual measures is a tree or shrub windbreak. A windbreak will protect an area of 15 to 20 times its height. The protection it gives more than pays for its cost in taking up productive land. The Soil Conservation Service at its Rose Lake Plant Materials Center has many varieties of plants on trial to find those best suited for windbreaks.

Because of the time it takes before a tree windbreak offers adequate protection, temporary practices must be put on the land. Strips of grain such as oats planted in spring or rye planted in fall give protection to the beet crop. Generally these strips are planted at a rate of 2 bushels an acre, every other row of beets.

Buffer strips of rye, 7½ feet wide and spaced not more than 75 feet apart, will lower the wind velocity and trap moving particles. The open area can be reduced to less than 75 feet. The grain strip should be 10 percent of the open areas. These buffer strips can be planted the preceding fall or left when plowing a rye cover crop in spring.

Ridging the soil or leaving it in rough condition will lower the surface velocity of the wind. If soil lumps are doubled in size, it takes a wind eight times stronger to cause the same erosion.

A promising practice being used by an increasing number of farmers is fall-seeded oats. After working the land in the fall, oats are sown at a rate of 2 to 3 bushels an acre, depending on the soil and time of planting. On lighter soils beets then are planted the following spring through the oats with no previous tillage. On heavier ground, tillage may be necessary to prepare a good seedbed. Weeds are controlled with carefully applied herbicides.

Practices such as farming north and south, leaving residues on the surface, and keeping the soil in a rough condition can be done with little change in the accustomed farming operation.

Most farmers are aware of the crop damage and soil loss caused by wind erosion. If the wind carries away a layer of soil the thickness of a sheet of paper, the loss is equivalent to 3 tons an acre. Some effects of the erosion are less readily apparent, such as reduced soil fertility. Soil samples taken 8 feet above the ground during a duststorm showed a fertility level of 2½ times greater than the field from which the soil came, indicating that the wind sorts and carries away the most fertile soil particles.

Another loss that can be reduced by slowing the wind velocity is related to moisture. A study in Nebraska showed that per-acre yields for sugar beets increased from 21.0 tons to 26.5 tons when the beets were planted between double rows of corn spaced 50 feet apart. ♦

A row of rye between every other sugar beet row cuts wind erosion.

Special methods solve construction problems

By Joseph H. Hanson and Scott B. Passey
Project engineer and area conservationist, SCS, Ferron and Price, Utah

The need for a large multipurpose dam on a difficult site in the Ferron Creek Watershed Project called for unusual methods of construction at the Millsite Reservoir west of Ferron, Utah.

Since the reservoir was to store water for irrigation and municipal use, it was necessary to stop percolation through the 100 feet of sand and gravel above bedrock at the damsite. A "cutoff trench," constructed by the slurry method, solved this problem.

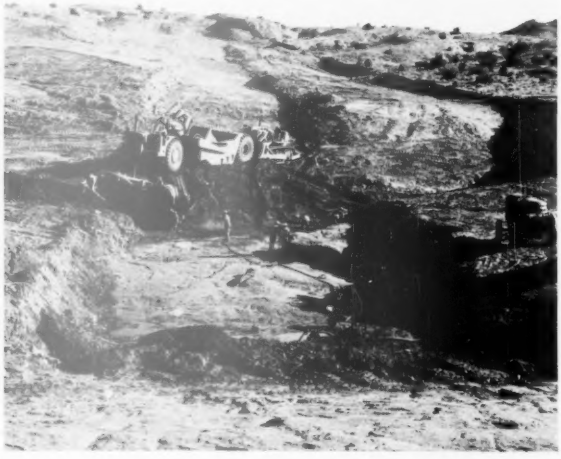
In order to make a sound dam with the fill material available, a "zoned" fill was designed to use fine-textured materials in the core, gravelly soils for the bulk of the dam, and rock on the faces.

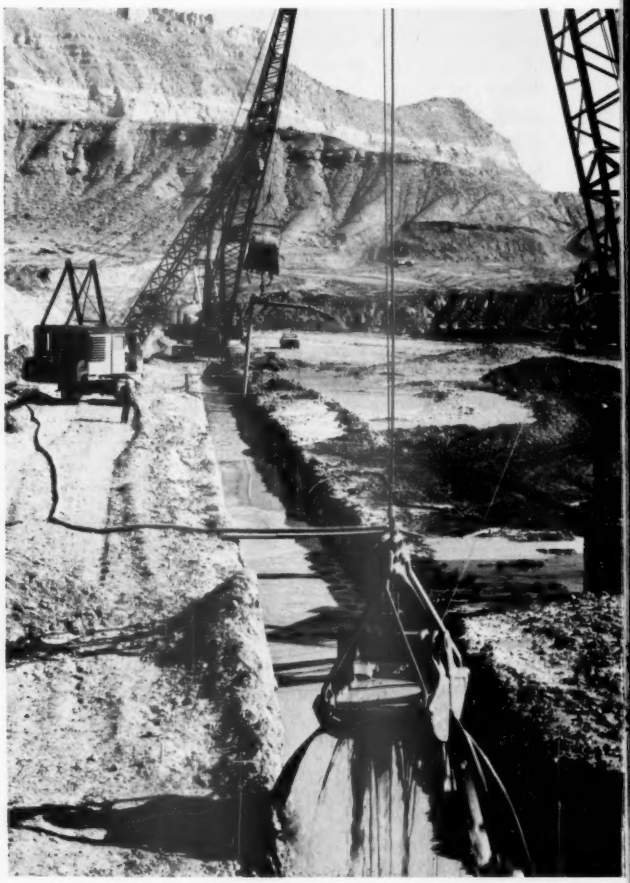
The resulting structure is acknowledged by engineers to be one of the largest and most complex constructed under the Public Law 566 small watershed program. It is 114 feet high, 4,000 feet long, and will create a reservoir of 18,000 acre-feet capacity.

In addition to irrigation and municipal water, the Millsite Reservoir will provide flood protection and water-based recreation. Other features include eight debris basins for flood control, three permanent-level fishing lakes, conservation treatment of private and federal lands of the watershed, and rehabilitation of irrigation systems.

The "slurry trench" was constructed at the upstream toe of the dam to stop the passage of water through the porous valley fill. The contractor, Strong Construction Company of Springville, Utah, used a dragline with a 120-foot boom and a 12-ton bucket to excavate a trench 8 feet wide across the old stream channel down to bedrock. Workmen filled the trench with a mixture of bentonite and water when digging began and completed the excavation with the trench always full of the slurry. The slurry and its weight kept the vertical sides of the trench from caving.

Upon completion of the excavation, a stiff mixture of bentonite and soil was prepared with bulldozers along the edge of the trench and pushed in to replace the thinner mixture. This treatment created an im-





The contractor begins the excavation of the cutoff trench (above) by removing soil and cleaning the bedrock with hand shovels and compressed air. Deeper portions of the trench (right) were completed with a dragline working in a slurry of bentonite.

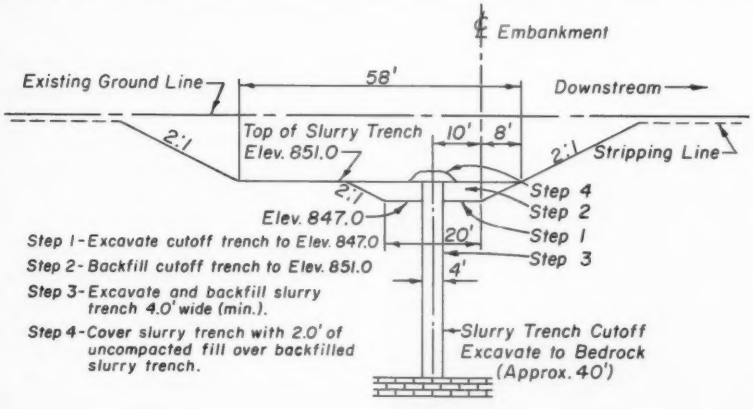
XUM

pervious barrier across the valley under the edge of the dam then constructed over it.

The Millsite Dam was designed to make use of large amounts of well graded gravel at the site. The zoned fill began with a center core of fine-textured materials well compacted to resist seepage. Zone II materials, placed on both sides of zone I, consist of gravelly soils containing less clay and silt but with rocks up to 5 inches in diameter. Then zone III, consisting of rock from 5 to 36 inches in size, was placed upstream and downstream from the zone II.

Two horizontal drains 3 feet thick made of zone III rock were placed in the upstream side of the dam during construction. A 3-foot horizontal drain was also built in the downstream side above the outlet conduit level, extending into the dam to the middle of the zone II material then vertically to the top of the dam. These drains provide earthquake protection and assure good drainage of the fill as the water level of the reservoir lowers. ♦

The Millsite Dam, with 25 feet of its 114-foot height completed, shows the rock facing placed against the zone II gravely fill. Below is a cross-section drawing of the Plum Creek slurry trench.



SLURRY TRENCH CONSTRUCTION DETAILS

Slurry trench stops water, saves money

By Robert C. Bintzler
Assistant state conservation engineer, SCS, Madison, Wis.

Through a unique method of excavation, a 40-foot-deep trench with vertical sides was dug at a saving of $100,000 in constructing a multiple-purpose dam in the Plum Creek Watershed Project near Plum City, Wis.

No shoring was required, nor was equipment needed to keep the trench free from ground water. The "slurry trench" method was used to seal porous alluvial material on which the dam was to be built.

The contractor, Link Brothers Construction, Inc., sublet the work to a Los Angeles firm, Industrial Engineering and Equipment Corporation. Sponsor of the construction was the Pierce County Soil and Water Conservation District of Wisconsin.

The method used in the excavation was based on the principle that sodium bentonite, when mixed with water, expands. This increases the viscosity and produces a mixture with specific gravity greater than water. The bentonite particles build up in thin layers within the voids of the trench walls, creating a crust impervious to water. The outward pressure of the slurry on the walls prevents sloughing or caving-in. Heavy equipment can work at the edge without danger of sloughing.

The slurry is created in a special mixer where the bentonite is bombarded with jets of water at 100 pounds per square inch pressure.

After the mixing, the slurry is circulated in a holding pond by pumps to keep the bentonite in suspension.

In the Plum Creek Project 6 percent of bentonite by weight was enough to maintain the proper vis-

cosity and density. Density of the slurry was kept at 65 to 85 pounds to the cubic foot.

The contractor used a dragline with an 80-foot boom and a 1½ cubic-yard bucket 5 feet wide. Boulders and cemented gravels made the operation slow and difficult. It was necessary to modify the design of the bucket and to build a special ripper to loosen the material in the trench.

When too much sand became suspended in the slurry, it was necessary to remove the sand, to keep the density below 85 pounds per cubic foot. A machine operating on the principle of a cream separator was used for this purpose.

It was also necessary to clean sand and other material from the trench bottom during excavation. An air-lift pump that worked like a vacuum cleaner sucked up sand, gravel, and cobbles up to 6 inches in diameter.

Backfill material consisted of a mixture of the bentonite slurry with silt, sand, and gravel up to 3 inches in size. The backfill was placed with a clam-shell bucket starting at one end of the trench. As the trench was filled, excess slurry was pumped into a holding pond for later use in the dam. ♦

Straight and narrow, the slurry trench nearing completion (above) cuts across the valley floor. The bucket on the dragline (below) was modified to rip cemented gravels in the alluvium.

4-Hers concerned about environment

Six national winners in the 1970 4-H Conservation of Natural Resources program will each receive $600 educational scholarships provided by John Deere and Company.

The winners are:

David Buerr, 16, of Gilroy, Calif., on the basis of his outstanding work in fighting erosion. He constructed 15 gully-control structures, planted seedlings, and entered a conservation float in a parade.

Lorin Cass, 19, of Hasty, Colo., by transforming his family's run-down farm into a highly productive one.

Mike Sumner, 18, Sumner, Ga., by rebuilding and stocking four fish ponds and virtually halting soil erosion on his family's farm.

Rachel Koontz, 18, of Fort Wayne, Ind., for carrying out an analysis of conservation problems and practices in housing developments in southeast Fort Wayne. She found that natural water was draining in a manner that would ruin drain plains laid out by the city.

David Shafer, 18, of Titusville, N. J., for building a dam and organizing a program to educate children on conservation of natural resources. He learned how by keeping his lawn from eroding and the river bank from washing out.

Tom Dake, 16, of Armour, S. Dak., for getting the soil on his grandfather's old farm in shape by repeated plowing and disking, thus saving his family more than $5,000. He learned from his 4-H forestry project and other projects including beef, electric, sheep, and health. ♦

Shining river

Agencies move to restore stream that thrilled Stevenson

By Donald B. vonWolffradt
Hydraulic engineer, SCS, Harrisburg, Pa.

"And when I asked the name of the river from the brakeman and heard that it was called the Susquehanna, the beauty of the name seemed to be part and parcel of the beauty of the land . . . that was the name, as no other could be for the shining river and desirable valley."—ROBERT LOUIS STEVENSON, *Across the Plains*

The Susquehanna River Basin has changed since Stevenson wrote those words over a century ago. Floods, pollution, and poor land use have gnawed away at the basin's beauty. And strip-mined hills and sediment-clogged streams have taken further toll.

In 1961, Congress called upon several federal agencies and three states to find ways to make the "shining river" glisten again for future generations. A coordinating committee made up of representatives of these agencies gave direction to the study.

The assignment was a big one. The Susquehanna River has 27,500 square miles of drainage. It is the largest river entirely in the United States that flows directly into the Atlantic Ocean.

The Soil Conservation Service mapped soils and rural social patterns, studied upstream flooding and agricultural trends, determined erosion losses and agricultural water needs, identified opportunities for upstream water-based recreation developments, and found solutions to rural water-resource problems. It depended heavily on counsel from the basin's residents.

Studies indicate that nearly 11 million acres are not properly protected to conserve soil, prevent sedimentation, and reduce runoff. This includes 140,000 acres of coal-mine spoil areas in need of vegetation and other conservation measures.

Other problems are flood damages that total more than $6 million each year in upstream areas alone. The need for water-based recreation is intensified since the basin is in an area of large and rapidly expanding population centers.

Most of the river's rebirth will come about through combining work of several agencies. SCS will provide technical assistance for planning and installing needed land-treatment measures for soil and water conservation on the nonfederal lands of the basin. It will provide planning assistance, engineering services, and cost-sharing for the installation of multiple-purpose watershed projects under Public Law 566. Recreation will be an objective in many of these projects to meet increasing needs.

More than 2¼ million acres will need conservation-treatment practices applied during the next 15 years. Included are 180,000 acres that need accelerated land treatment upstream from reservoirs to reduce sedimentation rates. The intent is to conserve and improve natural resources, establish a balanced agriculture, provide an improved and more stable agricultural economy, reduce flooding and sedimentation, and improve the quality of living of the residents in the Basin.

If all goes as planned, one day Americans will understand what Robert Louis Stevenson meant when he wrote *Across the Plains*. ♦

Conservation in action...

Cooperation stops floods in the Kickapoo Bottoms

Kansas

If you ask a landowner in the Kickapoo Bottoms along the Missouri River in Leavenworth and Atchison counties in Kansas how the people there solved their flood problems, it is likely he would have a ready answer.

"We worked it all out together," he might say. "Cooperation, a lot of it."

The farmers of the Kickapoo Bottoms had worried with flooding for many years. Originally the flooding was from the Missouri. A levee along the river in 1962 as part of the U.S. Army Corps of Engineers flood-control program corrected that.

But the farmers still had to contend with flooding that came from 1,169 acres of upland and from the bottom land itself.

The solution recommended by specialists of the Soil Conservation Service was a series of floodwater dams in the upland area with a ditch the length of the bottom lands to carry runoff.

The 10 landowners joined others concerned with land use in the area —telephone company, pipeline firm, Missouri Pacific Railroad, local representatives of the Rural Electrification Administration, Leavenworth County Board of Commissioners, and the Kickapoo township board.

The group applied to the Leavenworth County ASC Committee for cost sharing under the Agricultural Conservation Program. SCS specialists working through the two soil conservation districts designed the system of dams and drainageways, side ditches, and floodgates.

The completed project includes five flood-detention dams in the hills that control drainage from 242 acres through 16 lateral ditches entering a main ditch. The diked drainage ditch is 20,300 feet long, 4½ feet deep, and 16 feet wide at the bottom. The ditch parallels the railroad and the face of the uplands and picks up runoff from 450 acres of steep uplands and 1,198 acres of flat bottom land.

The main ditch empties into Salt Creek near its junction with the Missouri River. At the outlet end of the drainage ditch, a pipe has been installed with a flap or floodgate to prevent floodwaters from the Missouri River and Salt Creek from backing into the ditch. Each lateral ditch also has a flap gate.

The telephone company moved its lines from the site of one of the dams. The township board relocated a road to cross one of the dams, in place of a bridge. The county cooperated in furnishing culvert pipe where a county road crosses the ditch.

In summer 1969, two extremely heavy rains occurred even before the upper 2 miles of the ditch was completed. Excess water drained into the ditch, and no damage occurred to crops. Another time the Missouri River was high, and water was backed against the outlet flap gate.—FRED L. TRUMP, *information specialist, SCS, Salina, Kans.*

Texas

No-wash crossings are winning friends

County Commissioner John Avery of Bonham, Tex., is known in the Fannin County Soil and Water Conservation District as a friend to farmers, school bus drivers, mail carriers, and others who must use rural roads.

Avery is a believer in replacing rickety county road crossings with drop structures of dams that you can drive across and that don't flood or wash out in bad weather. The structures also reduce erosion and downstream sediment damage.

When Avery is ready to replace a bridge, he calls on Soil Conservation Service engineers to help determine whether it is feasible to replace the span with a dam. If so, the dam and a pipe drop structure are designed and laid out by SCS conservationists assisting the Fannin County District. Consideration is given to soils, drainage area, and an emergency spillway.

Most structures have enough storage capacity so the emergency spillways will not be expected to function more often than about once every 25 years. The small lakes above the dam also provide livestock water.

Built with county equipment, the combination bridge and drop structure may cost from $1,000 to $5,000, depending upon size. Twenty of the structures have been built so far.—TRUMAN ATKINS, *district conservationist, SCS, Bonham, Tex.*

Wyoming

Facts for growing

A year before the summary of the Conservation Needs Inventory for Wyoming was ready, requests for copies of it began arriving.

Libraries, agencies of government, planning firms, and heads of industries were foremost among those seeking copies of the report.

The Wyoming Water Planning Program made use of information in the summary in developing the Wyoming Water Plan. The identification of land suitable for sustained irrigation and the productivity of these lands within river basin areas were of special concern.

The Wyoming Department of Economic Planning and Development used information from the inventory in developing plans for its projects in the state. In the Riverton

area the information helped determine acreages suitable for sugar beets when the location of a sugar beet processing plant was considered. In Laramie and Goshen counties information was needed on soils suitable for potato growing.

Glenn Hertzler, commissioner of agriculture for Wyoming, regards the summary as a valuable storehouse of information on land use, soil conditions, and areas needing special treatment.

"I have found it to be a most useful reference for basic data in the development of our Agricultural Sector Study and evaluating potential small watershed projects," Hertzler said.

Kenneth R. Sturman, director of the Wyoming Division of Resource Conservation, believes that the inventory will be useful in Wyoming for a long time.

"We will have use for this information as long as Wyoming agriculture is developing," he predicted.—R. C. KRONENBERGER, *state soil scientist, SCS, Casper, Wyo.*

Missouri

Landowners help county keep roadsides green

Vince Hanley, road superintendent for St. Charles County in east central Missouri, believes that seeding rights-of-way after road improvement should be part of every county's road building plan.

The County Court, St. Charles Soil and Water Conservation District, and Hanley have cooperated in the seeding of rights-of-way in St. Charles County. To encourage this practice they developed a unique agreement with property owners along the roads.

Landowners along each new or reconstructed county road get a letter explaining that the county court will pay for grass seed, covercrop seed, fertilizer, and mulch used for seeding the right-of-way if the landowner will do the work. Hanley, as road superintendent, reports to the conservation district clerk which roads need seeding. The clerk then determines ownership along the road and the length of right-of-way needing seeding.

Using a standard formula of seed, fertilizer, and mulch per 1,000 feet of right-of-way, the clerk computes the amount of materials each landowner is authorized to purchase. After the work is done the landowner notifies Hanley, who inspects the job. If the work is satisfactory, the County Court authorizes payment.

The program is voluntary. Although the program has only been in effect a short time, it appears that about half of the landowners will participate.

Benefits to the county and landowners are already apparent. Brush and weeds are being controlled. Roads are easier to maintain and are safer. Sediment is withheld from waterways, ponds, and drainage ditches. An added bonus is that farms are more attractive and the countryside is more pleasant for travelers, Hanley points out.—LESLIE F. VOLMERT, *district conservationist, SCS, St. Charles, Mo.*

Charlie Martin's pasture pond.

Virginia

Farm is a billboard for conservation

Motorists driving down the eastern slope of the Blue Ridge in Patrick County, Va., get the message: *Conservation Controls Pollution.* The lush green pastures and the crystal clear pond on Charlie Martin's farm tell the story.

As a cooperator with the New River Soil Conservation District, Martin has turned his farm into a conservation billboard.

A year ago, passing motorists on Highway U.S.-58 saw roadbanks that were eroded and briars and honeysuckle vines cluttering the view of a pond that nearly went dry with every drought.

Together, Martin and Ed Sumpter of the Soil Conservation Service devised a plan to combine beauty and conservation. Martin cleared the ditchbanks and graded them, then fertilized, limed, and seeded them with Kentucky 31 fescuegrass. He built a 500-foot diversion across the slope to carry excess water away from the roadsides to the pond.

The pond now stays full, and the passing public sees it in the setting of a green pasture. Also his work has reduced the amount of sediment going down the road.—DONALD L. RAY, *district conservationist, SCS, Stuart, Va.* ◆

XUM

Erosion control along highways

By J. Guy Moorefield
District conservationist, SCS, Wichita, Kan.

Soil erosion control is no longer considered exclusively an agricultural matter in Kansas.

One of the biggest users of land in the state, the Kansas Highway Commission, has a comprehensive erosion-control program of its own.

A. A. Holmquist, division engineer at Hutchinson, credits the excellent cooperation between the commission and the Soil Conservation Service at both state and local levels. The commission's program in Sedgwick County, for example, consists of shaping and seeding highway rights-of-way and installing concrete structures according to standards agreed on by the two agencies.

Smoothing and shaping of the land reduces erosion both on the right-of-way and on adjacent land, which in most cases is farmland. Care is taken to avoid the impounding of water on the right-of-way and on adjacent land.

Sloping concrete structures are built wherever needed to prevent gully formation by water flowing down right-of-way slopes. The structures are usually located at outlets of farm terraces that have been cut by the highway. An 8.5-mile stretch of Highway U.S.-54 west of Wichita, for example, has 63 structures.

The Highway Commission uses SCS soil data and recommended grasses and legumes for seeding along highways and on "borrow" areas. Generally a mixture of native grasses is used.

The commission carefully selects grass mixtures according to the needs of the soil. Sand lovegrass is part of the mixture on sandy soil, alfalfa and clovers on heavier soils. Alfalfa and bromegrass are seeded on the more productive soils. The seeded areas are fertilized heavily.

Highway workers blow old hay over the seedings to form a mulch; special equipment punches the mulch into the ground to keep it from washing or blowing away. In some places jute netting or a thin spray of asphalt is spread over the seedbed to temporarily check erosion until the grass comes through. ♦

Alfalfa stabilizes slopes of grade (above) crossing over new Highway U.S.-54 near Wichita. Jute netting is used to protect roadside from erosion until grass is established. A. A. Holmquist (left) of Kansas Highway Commission and the author check a new seeding.

Meetings . . .

Ecology heads AASA's educational program

The annual meeting of the American Association of School Administrators will be held February 20-24 in Atlantic City, N.J. "Education '70's—Prelude to the Twenty-First Century" will be the theme, and ecology will be a main discussion topic.

Others include parochial aid, voucher systems, technology, performance contracts, student unrest, open schools, and recruiting superintendents from minority groups.

Resolutions to be considered are on performance contracts, how to handle student unrest, the superintendent's role at the negotiation table, and recruiting superintendents outside the ranks of education.

At this convention there will be what AASA calls the greatest assemblage of educational materials ever put together under one roof. AASA plans to take over one closed circuit cable TV for 5 days and will present 126 telecasts with more than 300 experts on educational topics.

FCF to emphasize ecology

"Ecology" will be one of the subjects discussed at the 4th annual convention of the Family Camping Federation of America February 26-28 in St. Louis, Mo. Of vital interest is what FCF is doing to help preserve the natural resources for future generations of campers.

Other topics to be covered include: "Camping in the Surging Seventies," "The Nation's Economy as it Relates to Camping," "Recreation in Campgrounds," "Good Dealer Displays and Show Techniques," "Will Campers Ruin Camping?," "Are Recreation Vehicle Owners Campers?," "Is Camping Doomed in Public Parks?," and "Recreation Predictions—Fact or Fantasy?"

The FCF is offering its first Annual Camping Research Award designed to recognize original contributions to the field of family camping by graduate students in park and recreation management curriculums.

Professionalism is SIA's goal

The Sprinkler Irrigation Association at its annual technical conference February 21-24 in Denver, Colo., will present as its theme, "Building Professionalism Through the SIA."

Among topics to be discussed are: "Water Management Under Sprinklers," "Sprinkling System Operation and Maintenance," "Financing Sprinkler Irrigation Development," and "Turf Irrigation." The panel discussions include qualifications, ratings, and obligations of consultants, contractors, distributors, and suppliers.

ASRM questions environmental quality

"Rangeland, Environment, and Man" will be the theme of the 24th annual meeting of the American Society of Range Management, February 15-18, at Reno, Nev.

In the sessions such topics as rangeland ecology, watersheds, resource planning, ecological resource inventories, socio-economic aspects, and rangeland livestock will be discussed. One session will be held to take up the question, "What is Environmental Quality?"

NACD emphasizes environment, economics

The National Association of Conservation Districts' 25th Anniversary Convention will be held February 7-11 in Chicago, Ill.

Topics include: "Cleaning Up Our Act," "Relating District Programs to Today's Problems," "Project SOAR and the 1971 Conservation Good Turn," and "The Prospects for Agriculture and Resources in the 70's."

NAOC emphasizes today's problems

"National Economic Situation and Outlook for 1971" will be the theme of the National Agricultural Outlook Conference February 23-26, Washington, D. C.

"Agricultural Situation and Outlook" will be discussed in the general sessions; "The Environment," "Medical Care," and "Food," in the family living sessions; "Commodity Situation and Outlook" in the commodity sessions; and "The Rural Labor Force" in the rural life sessions.

Farmers Union meets on environment

The National Farmers Union will present a strong action program centering around environmental and marketing problems of farmers at its annual convention February 24-27 in Washington, D.C.

Dates and places

February 7-11, National Association of Conservation Districts, Chicago, Ill.

15-18, American Society of Range Management, Reno, Nev.

20-24, American Association of School Administrators, Atlantic City, N.J.

21-24, American Road Builders Association, Los Angeles, Calif.

21-24, Sprinkler Irrigation Association Technical Conference, Denver, Colo.

23-26, National Agricultural Outlook Conference, Washington, D.C.

24-26, Land Improvement Contractors of America, Indianapolis, Ind.

24-27, National Farmers Union, Washington, D.C.

26-28, Family Camping Federation, St. Louis, Mo.

March

5-7, National Wildlife Federation, Portland, Oreg.

5-11, Association of General Contractors of America, San Diego, Calif.

7-8, The Wildlife Society, Portland, Oreg.

7-10, Association for Supervision and Curriculum Development, St. Louis, Mo.

14-19, American Pulpwood Association, Boca Raton, Fla.

14-20, National Wildlife Week.

16-19, National Rivers and Harbors Congress, Washington, D.C.

27-Apr. 1, American Society of Planning Officials, New Orleans, La. ♦

XUM

Review

World plan for agricultural development

Provisional Indicative World Plan for Agricultural Development. By Food and Agriculture Organization of the United Nations. *1970. FAO, Rome. (Distr. by UNIPUB, Inc., New York), 2 vol. 672 pp. $8.50.*

Summary and Main Conclusions. 72 pp. $1.50.

The Provisional Indicative World Plan is described as "a synthesis and analysis of factors relevant to world, regional, and national agricultural development."

It proposes a strategy for agricultural development to meet the needs of an additional 1,000 million people expected in developing countries by 1985. It is not a "plan" in the conventional sense of the word nor a detailed blueprint for development, but rather an analysis of the major issues which are likely to be facing world agriculture in the 1970's and early 1980's, together with some recommendations regarding the most important directions in which efforts should be made.

These key objectives are listed:

(1) Securing a staple food supply for populations growing at rates of 2.5 to 3 percent per year.

(2) Improving the composition of the diet to correct dietary deficiencies.

(3) Earning and saving foreign exchange by economic import stabilization.

(4) Providing increased opportunity for employment both within agriculture and in agri-allied industries.

(5) Increasing productivity through intensive land and water use.

The report states that the attainment of these key objectives will not be feasible without a wide range of supporting actions—in the fields of marketing, credit, extension, training, and institution building. The plan emphasizes the need for closer coordination of activities leading to the development of integrated services to farmers and indicates possible models.

Irrigation and drainage are given a key role in increasing the intensity of land use, as are flood control, soil conservation, and other land-improvement measures.

The plan points out that trained manpower for the essential agricultural services will, either quantitatively or qualitatively, and often in both respects, be a major constraint on agricultural development. It points out the potentially acute shortage in the supply of intermediate or technical-level personnel, those who do the fieldwork providing agricultural services. This emphasizes the need for an unprecedented training program for middle level technical personnel.

The Indicative World Plan contains a wealth of material on agricultural development problems in the developing countries. What should be done is spelled out in some detail. Just how it will be done will remain the subject for continuing debate.—Joseph B. Rogers, *assistant to the administrator for foreign affairs, SCS, Washington, D.C.*

Resources and Man. By the Committee on Resources and Man, National Academy of Sciences—National Research Council. *1969. W. H. Freeman and Co., San Francisco. 259 pp.; illus. $5.95; paper $2.95.*

How fast are we depleting our natural resources? *Resources and Man* is the report of a special investigative committee formed by the National Research Council to answer this question. The credentials of the authors are impeccable. Their research is thorough, objective, and global in scope. Their findings are neither alarmist propaganda nor comforting pap.

Their conclusions: World resources are in rather serious trouble, owing chiefly to a large and rapidly increasing world population. Mineral reserves are fast nearing exhaustion, even allowing for the discovery of new supplies and more efficient extraction techniques. Fossil fuels cannot fulfill our energy needs much longer. And the committee believes we are quickly approaching the finite limits of food production—both on the land and in the sea.

Coming in the wake of all the ecological horror stories heard in the last couple of years, these foreboding prophecies may seem a little less than awesome, even anticlimactic. But *Resources and Man* is not typical of environmentalist literature. It is not a sentimental, impassioned outcry. It is an objective, methodical assessment of world resources, compiled as carefully and impartially as an accountant's ledger. The sources are listed; the formulas on which the calculations were based; the allowances which were made for new finds and scientific breakthroughs. The results are obviously phrased by men who are very professional, very cool, and quite systematic.

Resources and Man is must reading for everyone connected or concerned with the environmental crisis. It is not fun. It is authoritative. It is not fiction. It is hard, cold reality. It is ammunition for the environmentalist, a reprimand for scoffers, and a good reference for everyone. —Frank T. Cross, *Information Division, SCS, Washington, D.C.*

The Ecosystem Concept in Natural Resource Management. Edited by George M. Van Dyne. *1969. Academic Press, New York. 383 pp., illus. $6.50.*

Earth Day and the subsequent excitement over the environment have made the once obscure word "ecosystem" part of the common tongue. Everyone agrees that, whatever it

XUM

is, it needs to be protected.

Familiarity with a word, however, is not necessarily the same as understanding what it means. Even experts sometimes stumble when they try to explain the concept of the ecosystem.

More than a year before Earth Day, the American Society of Range Management organized a symposium on "the ecosystem concept in natural resource management" at its 1968 annual meeting. The principal papers of that symposium are now available in book form. Readers who are willing, and able, to think their way through these detailed and analytical treatises will find the word taking on meaning of real substance.

The 10 chapters are organized into four sections dealing with (1) the meaning, origin, and importance of the ecosystem concept, (2) its use in research, (3) its use in resource management, and (4) instilling the ecosystem concept in training.

Editor Van Dyne's preface and his concluding chapter on training clearly state the meaning of the concept and explain its importance in resource management. He emphasizes the complexity of the ecosystem in reality and argues for the interdisciplinary approach to research and practice, for "no one man can encompass all of the required specialities and knowledge." The individual chapters on grassland ecosystems, watershed ecosystems, and the interpretation of range, forest, wildlife, and watershed management in terms of the ecosystem concept fully support his thesis.

The book will be a useful tool for the professional conservationist of any specialty interested in integrating his efforts with those of his colleagues in the new ecological approach to resource management. If its meaning could be injected into the public understanding to the degree that the word itself has been accepted, there would be real hope for the environmental movement.—B.O.

Contours of Change, The 1970 Yearbook of Agriculture. *1970. USDA. 406 pp., illus. $3.50.*

The 1970 yearbook does a dramatic job of portraying recent changes in farming and in the processing and marketing of farm produce. Better yet, it provides an insight into the significance of the changes for all Americans—farmers and consumers alike.

The yearbook's main sections—"The Agricultural Revolutions," "Country and City—One Nation," "America's New Role in Agriculture," "A Look into the Future"—give some idea of the scope of the book. It is well illustrated, with both color and black-and-white pictures, some with startling impact.

Contours of Change is a readable book and important reading for anyone interested in natural resources, economics, sociology, the environment.—WALLACE L. ANDERSON, *director, Resource Development Division, SCS, Washington, D.C.*

New publications

Economic Impact of Second-Home Communities, a Case Study of Lake Latonka, Pa. BY RICHARD N. BROWN, JR. *1970. USDA Economic Research Service ERS-452. 55 pp., illus.* Describes the transformation of 1,275 acres of Pennsylvania farmland into a 1,600-lot second homesite subdivision with a 270-acre lake. Estimates that the first $7 million of development activities at Lake Latonka could generate $14 million of business activity before 1970, with less than 40 percent of the total accruing to local businessmen. Variable use and special use expenditures of homesite buyers and their guests generated $2.6 to $6.7 million of economic activity during 1965-70, with half of this total accruing to local business men. After 1970, however, use expenditures are expected to generate $0.5 to $1 million annually.

Air Pollution Injury to Vegetation. BY IBRAHIM JOSEPH HINDAWI. *1970. U.S. Department of Health, Education, and Welfare, Public Health Service, Environmental Health Service, National Air Pollution Control Administration Publ. AP-71. 44 pp., illus. $1.25.* Presents cross sections illustrated in color of plant cells and air spaces that serve as passages for pollutants. Dramatic photos of many plants and leaves show such plants as tobacco, pinto beans, lettuce, petunia, rose, potato, apple tree, etc., injured by hydrocarbons and nitrogen oxides producing ozone and PAN (peroxyacetyl nitrate), nitrogen dioxide, ozone-sulfur dioxide synergistic action, low concentrates of flourides, chlorine, ethylene, or others.

Sericea Lespedeza, Its Use and Management. BY WALTER J. GUERNSEY. *1970. USDA Farmers' Bull. 2245. 29 pp., illus. $0.35.* Gives the growth and management pattern of sericea lespedeza, a perennial summer legume that is well suited to the Atlantic Coast States and makes good growth westward into eastern Texas, Oklahoma, and Kansas and as far north as the southern half of Illinois, Indiana, and Ohio. The plant yields a good quality of hay and is one of the best upland pasture legumes for humid parts of the South. Sericea serves as a good soil-improving crop, provides excellent cover on steep or eroded slopes, and is most effective in waterways or outlets, field borders, and in stabilizing roadbanks and strip-mine spoil.

Major Statistical Series of the U.S. Department of Agriculture, How They Are Constructed and Used, Vol. 9, Farmer Cooperatives. BY BRUCE L. SWANSON. *1970. USDA Agr. Hbk 365. 9 pp. $0.25.* The handbook will consist of 11 volumes: *Agricultural Prices and Parity, Agricultural Production and Efficiency, Gross and Net Farm Income, Agricultural Marketing Costs and Charges, Consumption and Utilization of Agricultural Products, Land Values and Farm Finance, Farm Population and Employment, Crop and Livestock Estimates, Farmer Cooperatives, Market News, and Foreign Trade, Production, and Consumption of Agricultural Products.*

The Look of Our Land, and Airphoto Atlas of the Rural United States: North Central. COMPILED BY SIMON BAKER AND HENRY W. DILL, JR., *1970. USDA Agr. Hbk. 384. 63 pp., illus. $0.75.* Brings together the text of USDA Agriculture Handbook 296, *Land Resource Regions and Major Land Resource Areas of the United States,* with photos to show examples of land use and related information according to an established regional and area classification of United States land resources. The album-sized booklet shows characteristics of 28 land-resource areas in three regions comprising all or parts of 14 North Central States.

U.S. Population Mobility and Distribution. *1969. USDA Economic Research Service ERS-436. 39 pp., illus.* Charts on recent trends.

Recon . . .

Environmental education, recreation, and preservation are primary purposes of a 125-acre regional arboretum being developed near Austin, Minn. Twenty-eight groups, including the Mower County Soil and Water Conservation District, the Hormel Foundation, and the city of Austin, supported acquisition of the nature study area for use by schools in northern Iowa and southeastern Minnesota. The district and SCS helped the Austin Park and Recreation Department and Planning Commission prepare plans based on soil information. There will be opportunities for students and other visitors to see watershed and flood-plain management; critical area stabilization; woodland and wildlife management; and mechanical erosion-control practices. Interstate Highway 90 will give millions of visitors easy access to this outdoor laboratory.

Last fall a Georgia catfish farmer harvested 2 tons of catfish for each 100-foot section of raceway, according to State Conservationist Cecil Chapman. That's equivalent to 60 tons of catfish for each surface acre.

Developers paid half of the construction costs of the first dam completed in Virginia's Pohick Creek Watershed Project after it was enlarged for recreation at their request. Lake Braddock will be the nucleus of a planned community of low to moderate income homes. The developer deeded the permanent pool to the county and gave a perpetual easement for the 30-acre flood pool. Management of the lake will eventually be the responsibility of a community association. Residents of the Lake Braddock subdivision will be the first to enjoy the recreation and flood-protection benefits of this unusual Public Law 566 project. It was designed to cope with land use changes in a watershed undergoing rapid, intense urbanization. When completed, eight dams will reduce expected sediment yield by 75 percent and save public funds that would otherwise have been used to dredge Pohick Creek and the Potomac River.

"There probably is an 'environmental crisis.' Most of the major writers with science background seem to agree on that. They agree on the inevitability of results, assuming continuation of certain current conditions. They *disagree* on the time scale within which those results will occur and their reversibility . . . However, it is undeniably clear that we are smack-dab in the middle of a 'crisis about environment.' . . . We must start talking *about* environmental concern for what it is—an attitudinal set, a feeling. It is a social movement with all the force for revolutionary change that concept implies. If we fail to recognize this, we'll blow it."—R. W. COMSTOCK, *director of environmental affairs, Northern States Power Company, to the National Science Teachers Association, March 1970, Cincinnati, Ohio.*

A California landscape architect has built an experimental park on blacktop at the John H. Bader Elementary School in Huntington Beach, Calif. Because of the prohibitive costs of removing pavement and replacing soil, Richard Bigler spread gravel for drainage on the 3-acre site and installed a series of raised planters. They are filled with a soil mix and graded from 2 to 6 feet to simulate rolling land. Ivy is used as ground cover in addition to lawns planted in the unusual boxes over the blacktop. The root balls of more than 100 mature trees were enclosed in plastic bags before planting. Roots will break through as they readjust and grow in their new environment. Bigler's planter-park concept may be used to develop mini-parks in large parking lots reports *Western Landscaping News.*

"Scientists realize the dangers inherent in the fact that they must now advertise their activities in order to obtain public funds for the support of scientific research . . . One of the concerns is that this necessity . . . leads to extravagant claims concerning the results to be expected from scientific research . . . promissory notes are dangerous because they encourage a lazy acceptance on the part of the public of the belief that scientists can solve all the problems of the modern world by inventing new technologies and counter technologies. One need not worry about cigarette smoking because *they* will discover a cure for lung cancer; or about environmental pollution because *they* will find a way to clean the air of our cities and the water of our streams and lakes . . ."—RENE DUBOIS, *former presidential science adviser.*

The Tahoe Regional Planning Agency is using the first results of a detailed soil survey begun in the spring of 1968 and finished last year. A general soil map and report and 11 other interpretive maps are being used to prepare plans for controlled development in the Lake Tahoe Basin. The survey was originally requested by the Tahoe Basin Association of Soil Conservation Districts (composed of districts from California and Nevada) before Congress had even discussed the creation of the Tahoe Regional Planning Compact.

Completed conservation plans for the reclamation of a small lake benefit approximately 40 homes in the Jeto-Lake Association of Hendricks County, Ind. Over the past 2 years, landowners have dealt with severe bank erosion, a gullied emergency spillway, and ailing structure outlet, and weed growth in the 10-acre lake. Technical assistance was given by the Hendricks County Soil and Water Conservation District and SCS. A private engineer who lives in the subdivision supervised construction of the new concrete chute for the lake outlet. Practices applied will reduce future maintenance expenditures and beautify the area.

From the Administrator:

A big job being done, and to do

Conservation, it is well for us to reflect, is a fabric of various contributions in effort and responsibility.

The land user—the owner and the operator—has the most important role. He bears the responsibility to use the conservation measures needed on his property, and to maintain them so they function as intended over a long period of usefulness.

The professional planner and technician are cast in essential supporting roles of their own. It is their responsibility, working with landowners, to plan and design measures that fill the need in each instance and promote efficient operation. Their work must be practical and easy to maintain. It must be in harmony with the landscape, and pleasing, if possible, to the eye.

The contractor, whose machines shape the earth, has responsibility to adhere to the designs and specifications, producing well-finished installations, with operations controlled in a manner to avoid or minimize water and air pollution.

It is up to the rest of us, as citizens, to recognize the contributions of these dedicated individuals who, through their own efforts, protect our resources, use them wisely, and make our Nation an increasingly satisfactory place for living.

Achievement over the decades of our history has been impressive. Still, most of the conservation job is ahead of us. As some appraisers of our task have said, we must run fast merely to keep up with it.

We know that erosion and sediment damage are still a major and stubborn conservation problem. Billions of tons of soil are being removed and redeposited by water in transit every year. About a fourth of this goes into the Nation's streams.

We need to be concerned about the continuing loss of soil from our farm and ranch lands. Erosion along an estimated 425,000 miles of rural roads increases maintenance costs, creates safety hazards, and mars our landscape. And surveys show that some 148,000 miles of streambanks are subject to excessive scouring and cutting. Construction areas and building sites are known to be major sources of sediment output.

Soil conservation measures, skillfully fitted to each varying need, can and must produce for the people of America a pattern of resource use and management that will meet production, environmental, and living standard objectives.

In a single year machines move a billion cubic yards of earth in the conservation process—in earth dams, terracing, and grassed waterways, and in the grading and leveling of land for efficient water use.

Into the conservation process each year go hundreds of thousands of cubic yards of concrete, millions of feet of corrugated metal pipe, tile, concrete pipe, and aluminum sprinkler pipe.

Getting vegetation established on pasture, rangeland, and critical areas is requiring many million dollars' worth of fertilizer, lime, and seed.

Accustomed as we are to hearing astronomical figures in the daily news, such amounts tax our comprehension. They indicate, however, a tremendous rate of progress in our overall conservation task and a vast contribution by the men and machines involved in this phase of our conservation job.

America is investing heavily in the conservation of all resources and moving rapidly toward even greater expenditures for the protection and improvement of our total environment. This means broadening responsibility to be shared by all of us engaged in the design and application of conservation patterns across our American land.

Kenneth E. Grant

XUM

UNITED STATES
GOVERNMENT PRINTING OFFICI
DIVISION OF PUBLIC DOCUMENT
WASHINGTON, D. C. 20401

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $30

JAN
UNIVERSITY MICROFILMS
SERIALS SECTION
300 NORTH ZEEB RD.
ANN ARBOR, MI 48106

POSTAGE AND FEES PAID
GOVERNMENT PRINTING OFFICE

Streambank victory

Landowners along some of Colorado's famed, fast-flowing streams, who long have been troubled by the loss of land to streambank erosion and the pollution of the water resource by sediment, are slowly but effectively finding answers to the problem.

It is a problem affecting whole drainage areas, not individual holdings alone. And landowners and the conservationists helping them are quick to point out that methods are not all the same and that only further studies can develop overall solutions.

Gilbert Myers, who ranches along the Williams Fork River south of Craig in the Yampa Soil Conservation District, for years had watched the river eating away his hayland. After consulting with Soil Conservation Service engineers, he decided that a series of rock jetties would reduce the damage being done.

He placed the jetties in winter when the stream was low and rock could be hauled across meadows with a minimum of damage to the hayland. He built the jetties 30 to 40 feet long and about 6 feet high, angled at about 45 degrees to deflect the flow away from the banks.

His efforts have been successful. Erosion of the banks has been stopped.

Rich and Homer Winder, whose ranch is on the Little Snake River west of Craig, had reported a similar problem. Last year they finished the leveling of 54 acres for irrigation. It was imperative that the banks of the river be made stable.

Riprapped banks offer protection for section of new Colorado highway.

Through the winter the Winders hauled 1,200 cubic yards of rock 5 miles to the site. They riprapped the banks with some of the rock and used the rest for a series of jetties.

The Colorado Highway Department had streambank-erosion problems on a new stretch of road between Hamilton and Craig. The department needed to protect both road and adjacant farmland. This was done with a blanket of rock riprap on both sides of the stream. Jetties were not suited to the problem here because of the stream's limited channel.

The Soil Conservation Service furnishes technical assistance in the design, layout, and installation of the practice needed for streambank-erosion control. The Rural Environmental Assistance Program helps with a portion of the cost.—HARLAND G. ROSS, *engineering technician, SCS, Craig, Colo.* ♦

XUM